CLAIMS

1) A method of generating a hybrid grid suited to a heterogeneous medium crossed by at least one geometric discontinuity of known geometry, in order to form a model representative of fluid flows in this medium in accordance with a defined numerical pattern, the structure of the medium being known a priori from available data acquired through in-situ measurements, analyses and/or interpretations of images of the medium, comprising forming a hybrid grid including at least one first structured grid for gridding of at least part of the medium, forming at least one second structured grid for gridding of another part of the medium, forming at least one cavity between the at least one first structured grid and each at least one second structured grid with a sufficient size to allow formation of at least one non-structured grid providing transition between the structured grids, characterized in that it includes forming each non-structured transition grid by means of power diagrams and by imposing conformity of the non structured transition grids with the walls of each cavity.

2) A method as claimed in claim 1, applied to a heterogeneous medium where at least one geometric discontinuity is a pipe or a well of known geometry crossing the medium, characterized in that a radial type grid is formed around each well, each cavity being delimited around each second structured radial grid by deactivating grid cells of the first structured grid.

3) A method as claimed in claim 1 or 2, applied to a heterogeneous medium where at least one geometric discontinuity is a fracture or a fault crossing the heterogeneous medium, characterized in that a first structured grid and a second structured grid are formed in parts of the heterogeneous medium, on either side of each fracture, by respecting the

discontinuities thereof, each cavity delimited to include a non-structured transition grid being formed by deactivating grid cells of the first and second structured grids, on either side of each fracture.

4) A method as claimed in any one of the preceding claims, characterized in that it includes imposing to polygonal edges forming the walls of each cavity to be the edges of a Delaunay type triangulation.

5) A method for simulating, in accordance with a defined numerical pattern, the evolution of a process such as fluid flows in a heterogeneous medium crossed by at least one geometric discontinuity of known geometry, the structure of the medium being known a priori from available data acquired through in-situ measurements, analyses and/or interpretations of images of the medium, comprising forming a hybrid grid including at least one first structured grid for gridding of at least part of the medium, forming at least one second structured grid for gridding of another part of the medium, forming at least one cavity between the at least one first structured grid and each at least one second structured grid with a sufficient size to allow formation of at least one non-structured grid providing transition between the structured grids, characterized in that it includes :

- - forming the non-structured transition grids by using power diagrams and imposing conformity of the non structured transition grids with the walls of each cavity., and

- - solving the numerical pattern in the hybrid grid formed for the medium in order to model the process.

6) A method as claimed in any one of the previous claims, characterized in that each first structured grid is a non-regular grid, of CPG type.